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(54) Compact two sided cold plate support assembly with transfer tubes

Kompakte zweiseitige Kühlplattenträgeranordnung mit Transferleitungen

Ensemble compact formant plaque de support à deux faces doté de tubes de transfert

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(73) Proprietor: **Hamilton Sundstrand Space Systems
International, Inc.
Windsor Locks, CT 06096 (US)**

(72) Inventors:
• **Zaffetti, Mark A
Suffield, CT 06078 (US)**

• **Laurin, Michael B.
South Hadley, MA 01075 (US)**

(74) Representative: **Dehns
St. Bride's House
10 Salisbury Square
London EC4Y 8JD (GB)**

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Description

BACKGROUND

[0001] This disclosure generally relates to a cooling structure for cooling electronic components. More particularly, this disclosure relates to a cooling structure including a two sided cold plate support assembly.

[0002] Electronic components onboard aircraft or other vehicles that operate in extreme temperatures are typically protected from overheating by a cooling device. In some environments, air flow is either not available or insufficient to handle the thermal loads generated by the electronic components. In such applications, a cold plate is utilized through which a cooling fluid flows to remove heat from the electronic component. The cold plate is mounted adjacent the electronic component and supplied with fluid flow through appropriate conduits that lead to a fluid delivery system.

[0003] US 5495889 discloses a cooling device for power electrical components, the device having a heat sink including a circuit in which cooling fluid can flow and having a first side for exchange of heat with the component to be cooled.

[0004] EP 0508717 discloses an integrated heat sink module which includes a sinuously channeled base and a bonded top surface electrode that is dielectrically isolated from the base.

[0005] US 7521789 discloses an electrical assembly comprising a heat producing semi-conductor device supported on a first major surface of a direct bond metal substrate that has a set of heat sink protrusions.

[0006] US 5429183 discloses a plate-type heat exchanger and a joint structure thereof, in which an aluminum group material is used and a junction is made by use of a plate material with its opposite surfaces clad with an aluminum material.

SUMMARY

[0007] The present invention provides a cold plate assembly comprising: a support structure including a first face sheet and second face sheet attached to opposite sides of a cellular interior structure; a first cold plate disposed on the first face sheet, the first cold plate including at least one inlet, a second cold plate disposed on the second face sheet, the second cold plate including at least one outlet; and characterised by a tube extending through the support structure for communicating fluid between the first cold plate and the second cold plate, wherein the tube has been inserted into a space between the first and second face sheets of the support structure to create a passage for the fluid through the support structure between the first cold plate and the second cold plate.

[0008] In another aspect the present invention provides a method of assembling a structural support for a heat generating device, the method comprising: assembling

a panel including a first face sheet and a second face sheet attached to opposite sides of a cellular interior structure; mounting a first cold plate to the first face sheet of the panel; mounting a second cold plate to the second face sheet of the panel; and inserting a tube into a space between the first and second face sheets of the panel to create a passage for a cooling medium through the panel between the first cold plate and the second cold plate, wherein the tube has been inserted into a space between the first and second face sheets of the support structure to create a passage for the fluid through the support structure between the first cold plate and the second cold plate.

[0009] These and other features disclosed herein can be best understood from the following specification and drawings, the following of which is a brief description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010]

Figure 1 is a schematic view of an example two sided structural cold plate assembly.

Figure 2 is a sectional view of the example two sided structural cold plate assembly.

Figure 3 is a magnified sectional view of the example two sided structural cold plate assembly.

DETAILED DESCRIPTION

[0011] Referring to Figure 1, an example support assembly 10 includes a fixed structure 12 that supports a structural cold plate assembly 14 for thermally controlling and cooling heat generating devices 26. In the disclosed example, the heat generating devices 26 are electronic devices that generate heat during operation. As appreciated, although electronic devices are described as examples, the disclosed structural cold plate assembly 14 would be useful for any application requiring thermal management, including heating.

[0012] The example structural cold plate assembly 14 includes a panel 16 that includes a first side 18 and a second side 20. Mounted to the first side 18 is a first cold plate 22 and mounted to the second side 20 is a second cold plate 24. Each of the first and second cold plates 22, 24 define passages through which a cooling medium flows to remove and control heat produced by the devices 26. The panel 16 and thereby the first and second cold plates 22, 24 are supported by at least one mount 28 to the fixed structure 12. The fixed structure 12 could be a cabinet, wall, bulkhead or other fixed structure that provides a desired location for the devices 26. Moreover, although cold plates 22, 24 are disclosed by way of example, any heat exchanging device could also be utilized and would benefit from the example disclosures.

[0013] The first and second cold plates 22, 24 include passages or circuits through which the cooling medium flows to remove heat generated by the devices 26. The

devices 26 are mounted in thermal contact with each of the cold plates 22, 24 such that thermal energy is transferred to the fluid medium. In the disclosed example, the devices 26 are mounted on the corresponding cold plate 22, 24. However, other mounting configurations that place the cold plate in thermal contact with the devices 26 are within the contemplation of this disclosure.

[0014] The cooling medium is supplied by the first and second inlets 30, 32 that are mounted to the first cooling plate 22. The cooling medium can include a cooling fluid, air, or gas along with a combination of fluid, air and gas that facilitate the removal of heat generated by the devices 26. In this example the cooling plates 22, 24 each include two separate cooling circuits and therefore two inlets 30, 32 are provided. The cooling medium is then directed through passages (Figures 2 and 3) through the panel 16 to the second cooling plate 24. The second cooling plate 24 includes first and second outlets 34 and 36 that direct the cooling medium through other portions of cooling circulation system.

[0015] As appreciated, the cooling system may include a heat exchanger to dissipate heat absorbed by the cooling medium and a pump to power circulation of the cooling medium. Moreover, the example structural cold plate assembly 14 provides for the use of different cooling mediums such as different types of fluid in each of the separate circuits to provide desired thermal control capabilities. Further, although the example structural cooling plate assembly 14 includes two separate cooling circuits, one or more than two cooling circuits are also within the contemplation for use with the disclosed device.

[0016] Referring to Figure 2, the example panel 16 includes a top face sheet 38 and a bottom face sheet 40. The example face sheets 38, 40 are metal sheets that are adhered to top and bottom surfaces of several intermediate internal structures. Although metal sheets are disclosed by way of example, other material could be utilized to provide the structure of the face sheets 38, 40. The example panel 16 includes a honeycomb portion 42 that includes a plurality of open cells that is sandwiched between the top and bottom face sheets 38, 40. The open cell structure of the honeycomb portion 42 reduces the overall weight of the panel 16 while providing a desired structural integrity and strength. A frame structure 44 is also disposed between the two face sheets 38, 40 to provide a solid structure around the outer edges of the panel 16. The frame structure 44 also provides a location into which fasteners can be inserted.

[0017] The example face sheets 38 and 40 are adhered by an adhesive to an interior structure including the honeycomb portion 42 and the frame structure 44. The example adhesive is selected to provide the desired bond between the honeycomb portion 42, the frame structure 44 and the face sheets 38, 40 throughout the environmental operating range of the structural cold plate assembly 14.

[0018] An insert 46 is disposed within the panel 16 in the area where the tubes 60 extend. The panel 16 can

also include alignment pins 45 that locate the cold plates 22, 24 relative to each other on the panel 16. Other alignment and fastening features could also be included to secure and maintain the cold plates 22, 24 in a desired orientation on the panel 16.

[0019] Referring to Figure 3 with continued reference to Figure 2, the first and second cold plates 22, 24 each include two separate fluid circuits. The fluid circuits for the first cold plate 22 is defined by the circuit plates 48 and 50 (Figure 3) and the fluid circuits for the second cold plate 24 are defined by the circuit plates 52 and 54. The circuit plates are sandwiched between a top plate 56 and a bottom plate 58. The top plates 56 provide a surface on which the devices 26 are mounted. Moreover the top plates 56 are constructed of a material that provides for the transfer of thermal energy from the devices mounted thereon to the fluid medium flowing within the cooling plates 22, 24.

[0020] In this example, a first complete fluid circuit is defined by the circuit plate 50 of the first cold plate 22 and the circuit plate 54 of the second cold plate 24. A second complete fluid circuit is defined by the circuit plate 48 of the first cold plate 22 and the circuit plate 52 of the second cold plate 24. The specific configuration of the first and second fluid circuits are arranged to provide a desired thermal capacity for absorbing heat from the devices 26.

[0021] The fluid medium is directed from the first cold plate 22 through openings 64 in the panel 16 to the second cold plate 24. In this example, the openings 64 receive tubes 60 that are sealed to the plates 58 of the cold plates 22, 24. The tubes 60 provide the fluid communication as conduits between the cold plates and the corresponding fluid circuits.

[0022] The tubes 60 are installed through openings in the panel 16 that are created within an insert 46. Additional openings 64 are provided in the cold plates 22, 24 to provide for the insertion of tubes 60. The example tubes 60 are welded at the interface 66 with the plates 58 of the first and second cold plates 22, 24. The welded interface 66 may extend downwardly such that the insert 46 is also at least partly welded to the tubes 60. In the disclosed example, the tubes 60 are sealed using an electron beam welding process. The electron beam directs energy along the interface 66 to provide a desired fluid tight seal. The openings 64 in the cold plates 22, 24 provide access for the welding operation.

[0023] Once the tubes 60 are welded in place, the openings 64 in the cold plates 22, 24 are covered by caps 62. The example caps 62 seat onto a ledge 68 formed at the interface between the circuit plates of each cold plate 22, 24. The cap 62 is then welded in place to seal and hold it in place.

[0024] The welding operation generates heat that radiates into the panel 16 and thereby could affect the adhesive utilized to bond the face sheets to the honeycomb portion 42 and the frame structure 44. Accordingly, in this example an insert 46 is provided in the location where

the tubes 60 are assembled. The example insert 46 defines the openings for the tubes 60. Further, the insert is not bonded to the face sheets 38, 40 proximate the tube weld interface 66. Instead, the insert 46 defines a portion 70 of the top side 18, and a corresponding part of the bottom side (not shown).

[0025] Because the tubes 60 extend through the panel 16, additional external inlets, outlets, connectors, conduits, tubes are not required. Therefore the tubes 60 provide a robust fluid communication passage between the first and second cold plates 22, 24 that eliminates some of the exposed fluid conduits.

[0026] The example structural cooling plate assembly 14 is fabricated by first assembling the panel 16. The example panel 16 is assembled by bonding the top face sheet 38 and the bottom face sheet 40 to the honeycomb portion 42 and frame structure 44. In the location through which the tubes 60 will extend, the insert 46 is positioned and bonded by way of an adhesive. As is shown in Figure 3, the insert 46 provides a portion 70 that is not covered by the face sheet 38. This configuration spaces the adhesively bonded portions of the top face sheet 38 away from areas that are exposed to heat during welding operations.

[0027] The first and second cold plates 22, 24 are then assembled to include the desired circuit configurations. The example cold plates 22, 24 include two circuit plates each that separate fluid circuits that will be connected by the fluid passage through the panel. The cold plates 22, 24 are mounted to the panel 16. The openings 64 are then either created, or aligned through each of the cold plates 22, 24 and aligned with each other. In the example, the cold plates 22, 24 include the openings 64 that are aligned with the passages through the insert 46. Once the cold plates 22, 24 are aligned, the tubes 60 are inserted.

[0028] The tubes 60 are inserted such that each of the first and second ends of the tubes 60 form a substantially flush interface with the plates 58 of each corresponding cold plate 22, 24. An electron beam welding process is then performed to provide a continuous weld at the interface of the tube 60 and each of the plates 58 and the insert 46. The continuous weld provides a desired strength and provides a desired fluid tight seal. In the disclosed example, two tubes 60 are inserted and welded in place. As appreciated, other numbers of tubes could be utilized as are desired to provide the desired fluid passage between cold plates 22, 24.

[0029] In the disclosed example, the cold plates 22, 24 define two complete and separate fluid circuits. Accordingly, the fluid circuit plates 48, 50 of the first cold plate 22 and the fluid circuit plates 52, 54 of the second cold plate 24 are arranged to channel the fluid medium through a corresponding one of the tubes 60. This provides a complete fluid circuit that begins at one of the inlets 30, 32 on the top cold plate 22, through the corresponding one of the fluid circuit plates 48, 50 through one of the tubes 60, through the corresponding fluid circuit

plate 52, 54 of the second cold plate 24 and out one of the outlets 34, 36 (Figure 1). A second complete fluid circuit is defined in the same manner through those fluid circuit plates not used for the first fluid circuit.

[0030] Accordingly, the example structural cold plate assembly 14 provides a two sided thermal control structure that is built into the support structure and that reduces the number of exposed fluid conduits and connectors. Moreover, the integral structure of the disclosed structural cold plate assembly 14 aids in assembly and reduces overall package size and weight.

[0031] Although an example embodiment has been disclosed, a worker of ordinary skill in this art would recognize that certain modifications would come within the scope of this disclosure. For that reason, the following claims should be studied to determine the scope and content of this invention.

Claims

1. A cold plate assembly (14) comprising:

a support structure (16) including a first face sheet (38) and second face sheet (40) attached to opposite sides of a cellular interior structure (42);

a first cold plate (22) disposed on the first face sheet (38), the first cold plate including at least one inlet,

a second cold plate (24) disposed on the second face sheet (40), the second cold plate including at least one outlet; and **characterised by**

a tube (60) extending through the support structure for communicating fluid between the first cold plate and the second cold plate, wherein the tube has been inserted into a space between the first and second face sheets of the support structure to create a passage for the fluid through the support structure between the first cold plate and the second cold plate.

2. The cold plate assembly as recited in claim 1, wherein the tube (60) is welded to a portion of the first cold plate (22) and a portion of the second cold plate (24).

3. The cold plate assembly as recited in claim 1 or 2, wherein each of the first and second cold plates (22,24) comprises a bottom plate (58) mounted to a corresponding one of the first and second face sheets (38,40), and the tube (60) is joined to the bottom plate of each of the first and second cold plates.

4. The cold plate assembly as recited in any preceding claim, wherein the interior structure comprises a frame (44) to provide a solid structure around the outer edge of the support structure (16).

5. The cold plate assembly as recited in any preceding claim, wherein each of the first and second cold plates (22,24) comprises a first cooling circuit and a second cooling circuit that is separate from the first cooling circuit. 5
6. The cold plate assembly as recited in claim 5, wherein the tube (60) comprises a first tube that communicates fluid through the support structure (16) between the first cooling circuit in the first cold plate (22) and the first cooling circuit in the second cold plate (24), and a second tube communicates fluid through the support structure between the second cooling circuit of the first cooling plate (22) and the second cooling circuit of the second cooling plate (24). 10
7. The cold plate assembly as recited in claim 6, including an opening (64) through each of the cold plates proximate each of the first and second tubes and a cap (62) disposed over each of the openings for sealing the openings. 20
8. The cold plate assembly of any preceding claim, wherein the support structure is: a panel. 25
9. The cold plate assembly as recited in any preceding claim, including an insert (46) disposed within the support structure (16) and the tube (60) extends through the insert. 30
10. The cold plate assembly as recited in claims 5 to 7 or any one of claims 8, 9 when dependent on claim 5, including a first inlet (30) mounted to the first cold plate (22) for communicating a fluid medium to the first fluid circuit and a second inlet (32) mounted to the first cold plate (22) for communicating a second fluid medium to the second fluid circuit. 35
11. The cold plate assembly as recited in any preceding claim, including at least one alignment pin (45) for positioning at least one of the first cold plate (22) and the second cold plate (24) on the support structure (16). 40
12. A method of assembling a structural support for a heat generating device, the method comprising: 45
 - assembling a panel (16) including a first face sheet (38) and a second face sheet (40) attached to opposite sides of a cellular interior structure; 50
 - mounting a first cold plate (22) to the first face sheet of the panel;
 - mounting a second cold plate (24) to the second face sheet of the panel; and **characterised by** inserting a tube (60) into a space between the 55

first and second face sheets of the panel to create a passage for a cooling medium through the panel between the first cold plate and the second cold plate.

13. The method as recited in claim 12, including the step of sealing each end of the tube (60) to a corresponding one of the first and second cold plates (22,24) and preferably including the step of welding one end of the tube (60) to the first cold plate (22) and welding a second end of the tube to the second cold plate (24) to create a seal.

15 Patentansprüche

1. Kühlplattenanordnung (14) umfassend:

eine Trägerstruktur (16), die ein erstes Deckblech (38) und ein zweites Deckblech (40) beinhaltet, welche an gegenüberliegenden Seiten einer Mobilfunkinnenstruktur (42) angebracht sind;

eine erste Kühlplatte (22), die an dem ersten Deckblech (38) angeordnet ist, wobei die erste Kühlplatte mindestens einen Einlass beinhaltet, eine zweite Kühlplatte (24), die an dem zweiten Deckblech (40) angeordnet ist, wobei die zweite Kühlplatte mindestens einen Auslass beinhaltet; und **gekennzeichnet durch**

eine Leitung (60), die sich durch die Trägerstruktur zum Kommunizieren von Fluid zwischen der ersten Kühlplatte und der zweiten Kühlplatte erstreckt, wobei die Leitung in einen Raum zwischen dem ersten und dem zweiten Deckblech der Trägerstruktur eingeführt ist, um einen Kanal für das Fluid durch die Trägerstruktur zwischen der ersten Kühlplatte und der zweiten Kühlplatte zu erzeugen.

2. Kühlplattenanordnung nach Anspruch 1, wobei die Leitung (60) an einen Abschnitt der ersten Kühlplatte (22) und einen Abschnitt der zweiten Kühlplatte (24) geschweißt ist.
3. Kühlplattenanordnung nach Anspruch 1 oder 2, wobei jede der ersten und der zweiten Kühlplatte (22, 24) eine Bodenplatte (58) umfasst, die an einem entsprechenden des ersten und des zweiten Deckbleches (38, 40) montiert ist, und die Leitung (60) mit der Bodenplatte jeder der ersten und der zweiten Kühlplatte verbunden ist.
4. Kühlplattenanordnung nach einem der vorhergehenden Ansprüche, wobei die Innenstruktur einen Rahmen (44) umfasst, um eine feste Struktur um die Außenkante der Trägerstruktur (16) bereitzustellen.

5. Kühlplattenanordnung nach einem der vorhergehenden Ansprüche, wobei jede der ersten und der zweiten Kühlplatte (22, 24) einen ersten Kühlkreislauf und einen zweiten Kühlkreislauf, der von dem ersten Kühlkreislauf getrennt ist, umfasst. 5
6. Kühlplattenanordnung nach Anspruch 5, wobei die Leitung (60) eine erste Leitung umfasst, die Fluid durch die Trägerstruktur (16) zwischen dem ersten Kühlkreislauf in der ersten Kühlplatte (22) und dem ersten Kühlkreislauf in der zweiten Kühlplatte (24) kommuniziert, und eine zweite Leitung Fluid durch die Trägerstruktur zwischen dem zweiten Kühlkreislauf der ersten Kühlplatte (22) und dem zweiten Kühlkreislauf der zweiten Kühlplatte (24) kommuniziert. 10
7. Kühlplattenanordnung nach Anspruch 6, einschließlich einer Öffnung (64) durch jede der Kühlplatten nahe jeder der ersten und der zweiten Leitung und einer Kappe (62), die über jeder der Öffnungen zum Abdichten der Öffnungen angeordnet ist. 20
8. Kühlplattenanordnung nach einem der vorhergehenden Ansprüche, wobei es sich bei der Trägerstruktur um Folgendes handelt: eine Platte. 25
9. Kühlplattenanordnung nach einem der vorhergehenden Ansprüche, einschließlich eines Einsatzes (46) der innerhalb der Trägerstruktur (16) angeordnet ist, und wobei sich die Leitung (60) durch den Einsatz erstreckt. 30
10. Kühlplattenanordnung nach Anspruch 5 bis 7 oder einem der Ansprüche 8, 9 bei Abhängigkeit von Anspruch 5, einschließlich eines ersten Einlasses (30), der an der ersten Kühlplatte (22) zum Kommunizieren einer Fluidmediums zu dem ersten Fluidkreislauf montiert ist, und eines zweiten Einlasses (32), der an der ersten Kühlplatte (22) zum Kommunizieren eines zweiten Fluidmediums zu dem zweiten Fluidkreislauf montiert ist. 35 40
11. Kühlplattenanordnung nach einem der vorhergehenden Ansprüche, einschließlich mindestens eines Ausrichtungsstiftes (45) zum Positionieren mindestens einer der ersten Kühlplatte (22) und der zweiten Kühlplatte (24) an der Trägerstruktur (16). 45 50
12. Verfahren zum Anordnen eines Strukturträgers für eine Wärmeerzeugungsvorrichtung, wobei das Verfahren Folgendes umfasst:
- Anordnen einer Platte (16), die ein erstes Deckblech (38) und ein zweites Deckblech (40) beinhaltet, welche auf gegenüberliegenden Seiten einer Mobilfunkinnenstruktur angebracht sind; 55

Montieren einer ersten Kühlplatte (22) an dem ersten Deckblech der Platte;

Montieren einer zweiten Kühlplatte (24) an dem zweiten Deckblech der Platte; und **gekennzeichnet durch**

Einführen einer Leitung (60) in einen Raum zwischen dem ersten und dem zweiten Deckblech der Platte, um einen Kanal für ein Kühlmedium durch die Platte zwischen der ersten Kühlplatte und der zweiten Kühlplatte zu erzeugen.

13. Verfahren nach Anspruch 12, einschließlich des Schritts des Abdichtens jedes Endes der Leitung (60) zu einer entsprechenden der ersten und der zweiten Kühlplatte (22, 24) und vorzugsweise einschließlich des Schritts des Schweißens eines Endes der Leitung (60) an die erste Kühlplatte (22) und des Schweißens eines zweiten Endes der Leitung an die zweite Kühlplatte (24), um eine Dichtung zu erzeugen.

Revendications

1. Ensemble formant plaque froide (14) comprenant :
- une structure de support (16) comprenant une première feuille de face (38) et une deuxième feuille de face (40) fixée aux côtés opposés d'une structure intérieure cellulaire (42) ;
- une première plaque froide (22) disposée sur la première feuille de face (38), la première plaque froide comprenant au moins une entrée,
- une deuxième plaque froide (24) disposée sur la deuxième feuille de face (40), la deuxième plaque froide comprenant au moins une sortie ;
- et caractérisé par**
- un tube (60) traversant la structure de support pour permettre la communication d'un fluide entre la première plaque froide et la deuxième plaque froide, le tube ayant été inséré dans un espace entre la première et la deuxième feuilles de face de la structure de support afin de créer un passage pour le fluide traversant la structure de support entre la première plaque froide et la deuxième plaque froide.
2. Ensemble formant plaque froide selon la revendication 1, dans lequel le tube (60) est soudé à une partie de la première plaque froide (22) et à une partie de la deuxième plaque froide (24).
3. Ensemble formant plaque froide selon la revendication 1 ou 2, dans lequel chacune des première et deuxième plaques froides (22, 24) comprend une plaque inférieure (58) montée sur l'une correspondante des première et deuxième feuilles de face (38, 40), et le tube (60) est relié à la plaque inférieure de

chacune des première et deuxième plaques froides.

4. Ensemble formant plaque froide selon l'une quelconque des revendications précédentes, dans lequel la structure intérieure comprend un cadre (44) pour fournir une structure solide autour du bord extérieur de la structure de support (16) .
5. Ensemble formant plaque froide selon l'une quelconque des revendications précédentes, dans lequel chacune des première et deuxième plaques froides (22, 24) comprend un premier circuit de refroidissement et un deuxième circuit de refroidissement qui est séparé du premier circuit de refroidissement.
6. Ensemble formant plaque froide selon la revendication 5, dans lequel le tube (60) comprend un premier tube qui fait communiquer le fluide à travers la structure de support (16) entre le premier circuit de refroidissement dans la première plaque froide (22) et le premier circuit de refroidissement dans la deuxième plaque froide (24), et un deuxième tube fait communiquer le fluide à travers la structure de support entre le deuxième circuit de refroidissement de la première plaque de refroidissement (22) et le deuxième circuit de refroidissement de la deuxième plaque de refroidissement (24).
7. Ensemble formant plaque froide selon la revendication 6, comprenant une ouverture (64) à travers chacune des plaques froides à proximité de chacun des premier et deuxième tubes et un bouchon (62) disposé sur chacune des ouvertures pour sceller les ouvertures.
8. Ensemble formant plaque froide selon l'une quelconque des revendications précédentes, dans lequel la structure de support est :
un panneau.
9. Ensemble formant plaque froide selon l'une quelconque des revendications précédentes, comprenant un insert (46) disposé à l'intérieur de la structure de support (16), le tube (60) s'étendant à travers l'insert.
10. Ensemble formant plaque froide selon les revendications 5 à 7 ou l'une quelconque des revendications 8 à 9 lorsqu'elle dépend de la revendication 5, comprenant une première entrée (30) montée sur la première plaque froide (22) pour faire communiquer un milieu fluide au premier circuit de fluide et une deuxième entrée (32) montée sur la première plaque froide (22) pour faire communiquer un deuxième fluide au deuxième circuit de fluide.
11. Ensemble formant plaque froide selon l'une quelconque des revendications précédentes, comprenant au moins une broche d'alignement (45) pour permet-

tre de positionner au moins l'une de la première plaque froide (22) et de la deuxième plaque froide (24) sur la structure de support (16).

- 5 12. Procédé d'assemblage d'un support structural conçu pour un dispositif générateur de chaleur, le procédé comprenant :

l'assemblage d'un panneau (16) comprenant une première feuille de face (38) et une deuxième feuille de face (40) fixées aux côtés opposés d'une structure intérieure cellulaire ;
le montage d'une première plaque froide (22) sur la première feuille de face du panneau ;
le montage d'une deuxième plaque froide (24) sur la deuxième feuille de face du panneau ; le procédé étant **caractérisé par**
l'insertion d'un tube (60) dans un espace entre les première et deuxième feuilles de face du panneau afin de créer un passage pour un fluide de refroidissement à travers le panneau entre la première plaque froide et la deuxième plaque froide.

- 25 13. Procédé selon la revendication 12, comprenant l'étape consistant à sceller chaque extrémité du tube (60) à l'une correspondante des première et deuxième plaques froides (22, 24) et comprenant de préférence l'étape consistant à souder une extrémité du tube (60) à la première plaque froide (22) et à souder une deuxième extrémité du tube à la deuxième plaque froide (24) pour créer une étanchéité.

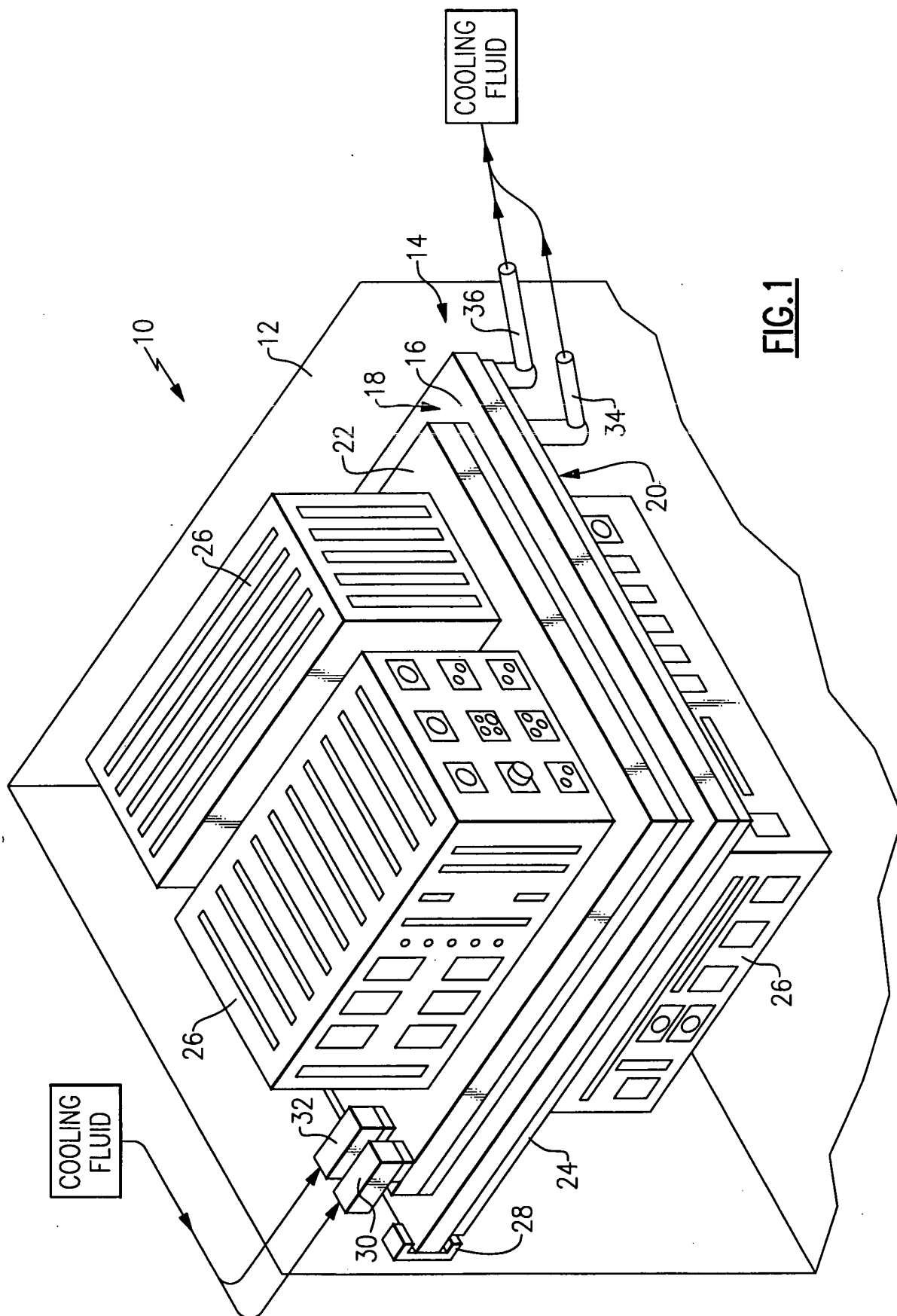
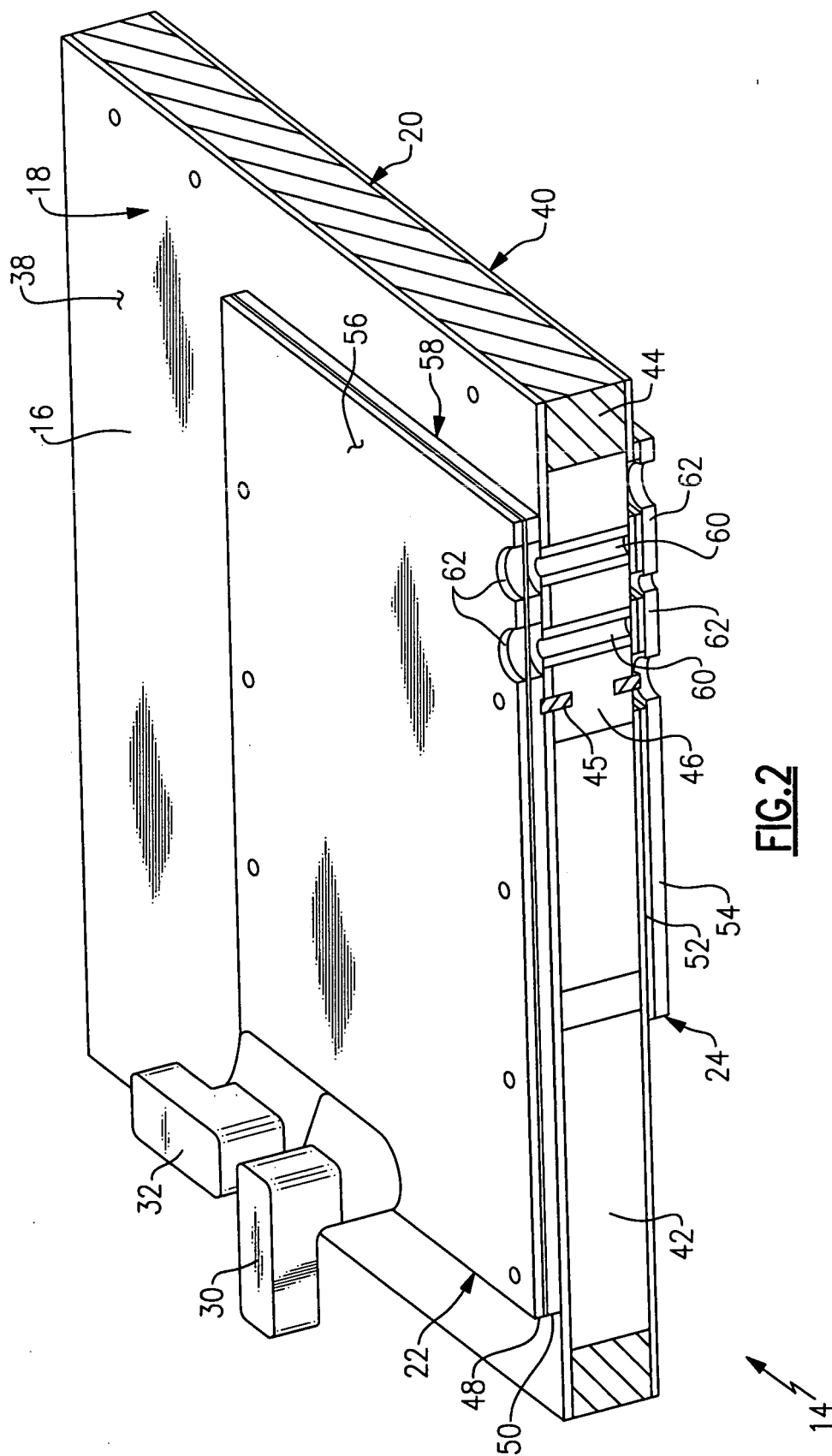


FIG. 1



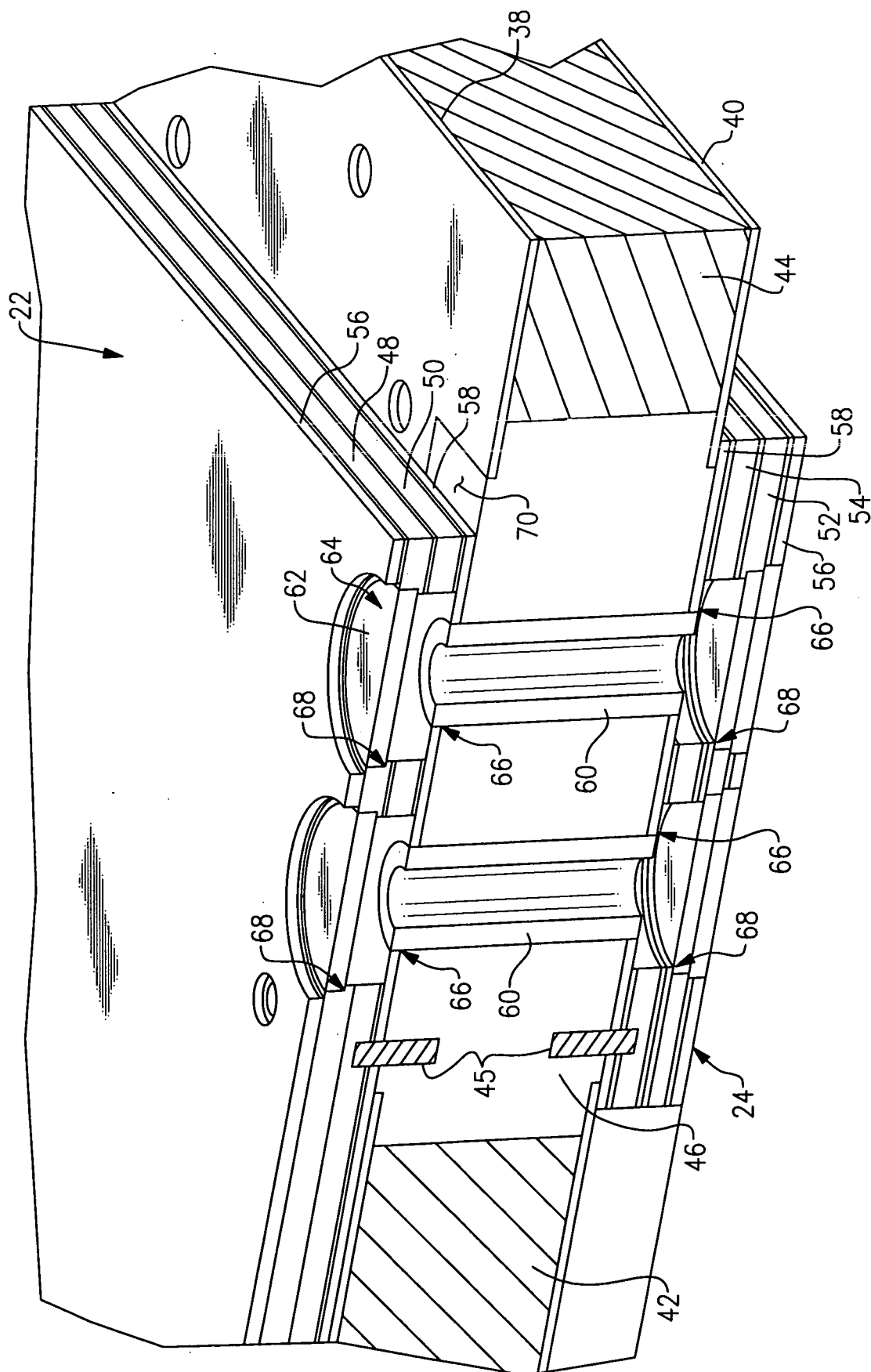


FIG. 3

REFERENCES CITED IN THE DESCRIPTION

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